WHAT IS TO BE CLAIMED IS:

1. A method of determining a maximum likelihood frequency domain estimate of the channel response of a channel between at least one transmitting peer and at least one receiving peer, said method comprising:

transmitting N_U reference tones from said transmitting peer to said receiving peer;

capturing said N_U reference tones at said receiving peer; and

determining at said receiving peer from said N_U reference tones said maximum likelihood frequency domain estimate of said channel response at N_F predetermined frequencies by directly exploiting the finiteness of the time response of said channel.

2. The method of Claim 1, wherein said channel comprises of N_C subchannels and N_U is less than N_C.

3. The method of Claim 1, wherein said channel comprises of N_C subchannels and N_U is less than N_F.

4. The method of Claim 1, wherein at least part of said reference tones are not equidistantly spaced apart.

5. The method of Claim 1, wherein said determining of said maximum likelihood frequency domain estimate comprises:

transforming said reference tones in time domain measurements;

determining from said time domain measurements maximum likelihood time domain estimates; and

transforming said maximum likelihood time domain estimates in frequency domain for obtaining said maximum likelihood frequency domain estimate.

6. The method of Claim 5, wherein said act of transforming said reference tones in time domain measurements comprises multiplying a partial N_H by N_U IFFT matrix with said reference tones with N_H the length of said finite time response.

7. The method of Claim 6, wherein the columns of said partial IFFT matrix are selected from a N_C by N_C IFFT matrix according to said reference tones and the rows of said partial IFFT matrix are selected from said N_C by N_C IFFT matrix according to the non-zero time samples of the impulse response of said channel.

8. The method of Claim 5, wherein said act of transforming said reference tones in time domain measurements comprises performing a partial N_H by N_U IFFT transformation on said reference tones with N_H the length of said finite time response.

9. The method of Claim 5, wherein said act of transforming said maximum likelihood time domain estimates into said maximum likelihood frequency domain estimate comprises multiplying a partial N_F by N_H FFT matrix with said maximum likelihood time domain estimates.

10. The method of Claim 9, wherein the columns of said partial FFT matrix are selected from a N_C by N_C FFT matrix according to the non-zero time samples of the impulse response of said channel and the rows of said partial FFT matrix are selected from said N_C by N_C FFT matrix according to said N_F predetermined frequencies.

11. The method of Claim 5, wherein said act of transforming said maximum likelihood time domain estimates into said maximum likelihood frequency domain estimate being based on performing a partial N_F by N_H FFT transformation to said maximum likelihood time domain estimates.

12. The method of Claim 5, wherein said determining from time domain measurements maximum likelihood time domain estimates is performed by solving a least squares estimation problem.

13. The method of Claim 5, wherein said maximum likelihood time domain estimates comprises linear combinations of said time domain measurements.

14. The method of Claim 13, wherein said linear combinations are defined by a N_H by N_H weighting matrix with N_H the length of said finite time response.

15. The method of Claim 14, wherein said weighting matrix is essentially different from the identity matrix.

16. The method of Claim 5, wherein said act of transforming from frequency domain to time domain, said act of determining of said maximum likelihood estimate and said act of transforming from time domain to frequency domain being performed directly by multiplying a N_F by N_U matrix with said reference tones.

17. The method of Claim 16, wherein direct determining of said maximum likelihood estimate of said channel from said reference tones is performed by solving a constrained least squares problem.

18. The method of Claim 1, wherein said act of determining said frequency domain maximum likelihood estimate is performed by multiplying a N_F by N_U matrix to said reference tones.

19. The method of Claim 1, wherein said determining of said maximum likelihood frequency domain estimate at the frequencies defined by said reference tones is based on orthogonal projection of said reference tones on the column space of a partial N_F by N_H FFT matrix.

20. The method of Claim 1, wherein said determining of said maximum likelihood frequency domain estimate comprises:

determining an intermediate result by multiplying a partial weighted N_H by N_U IFFT matrix with said reference tones with N_H the length of said finite time response: and

multiplying said intermediate result with a partial weighted N_F by N_H FFT matrix, to thereby obtain said maximum likelihood frequency domain estimates.

21. The method of Claim 20, wherein the weighting of said IFFT and FFT matrix is substantially similar to a weighting matrix.

22. A method of determining a maximum likelihood frequency domain estimate of the channel response of a channel between at least one transmitting peer and at least one receiving peer, said method comprising:

capturing N_U reference tones at said receiving peer; and

determining at said receiving peer from said N_U reference tones said maximum likelihood frequency domain estimate of said channel response at N_F predetermined frequencies by directly exploiting the finiteness of the time response of said channel.

23. The method of Claim 22, wherein said channel comprises N_C subchannels and N_U is less than N_C.

24. The method of Claim 22, wherein said channel comprises N_C subchannels and N_U is less than N_F.

25. The method of Claim 22, wherein at least part of said reference tones are not equidistantly spaced apart.

26. The method of Claim 25, wherein said determining of said maximum likelihood frequency domain estimate comprises:

transforming said reference tones in time domain measurements;

determining from said time domain measurements maximum likelihood time domain estimates; and

transforming said maximum likelihood time domain estimates in frequency domain for obtaining said maximum likelihood frequency domain estimate.

27. The method of Claim 26, wherein said act of transforming said reference tones in time domain measurements comprises performing a partial N_H by N_U IFFT transformation on said reference tones with N_H the length of said finite time response.

28. The method of Claim 26, wherein said act of transforming said maximum likelihood time domain estimates into said maximum likelihood frequency domain estimate comprises performing a partial N_F by N_H FFT transformation to said maximum likelihood time domain estimates.

29. The method of Claim 26, wherein said maximum likelihood time domain estimates are linear combinations of said time domain measurements, said linear combinations are defined by a N_H by N_H weighting matrix with N_H the length of said finite time response, whereby said weighting matrix is essentially different from the identity matrix.

30. The method of Claim 25, wherein said determining of said maximum likelihood frequency domain estimate comprises:

determining an intermediate result by multiplying a partial right-side weighted N_H by N_U IFFT matrix with said reference tones with N_H the length of said finite time response; and

multiplying said intermediate result with a partial left-side weighted N_F by N_H FFT matrix, to thereby obtain said maximum likelihood frequency domain estimates, wherein the weighting of said IFFT and FFT matrix is substantially similar to a weighting matrix.

31. A device at a receiving peer for determining a maximum likelihood frequency domain estimation of the channel response of a channel between at least one transmitting peer and at least one receiving peer comprising:

a first circuit configured to capture N_U reference tones, which are transmitted from a transmitting peer to said receiving peer; and

a second circuit configured to determine at said receiving peer from said N_U reference tones captured in said first circuit, said maximum likelihood frequency domain estimate of said channel response at N_F predetermined frequencies by directly exploiting the finiteness of the time response of said channel.

32. The device of Claim 1, wherein said receiving peer comprises an OFDM receiver.

33. A device at a receiving peer for determining a maximum likelihood frequency domain estimation of the channel response of a channel between at least one transmitting peer and at least one receiving peer comprising:

a circuit configured to determine at said receiving peer from N_U received reference tones said maximum likelihood frequency domain estimate of said channel response at N_F predetermined frequencies by directly exploiting the finiteness of the time response of said channel.

34. The device of Claim 33, wherein said circuit comprises

a frequency-to-time domain circuit configured to transform said received reference tones in time domain measurements;

an estimation circuit configured to determine from said time domain measurements maximum likelihood time domain estimates; and

a time-to-frequency domain circuit configured to transform said maximum likelihood time domain estimates in frequency domain for obtaining said maximum likelihood frequency domain estimate.

35. The device of Claim 34, wherein said frequency-to-time domain circuit comprises:

a plurality of multipliers configured to multiply a partial N_H by N_U IFFT matrix with said reference tones with N_H the length of said finite time response; and

a storage device, at least capable of storing said partial N_H by N_U IFFT matrix.

36. The device of Claim 34, wherein said frequency-to-time domain circuit comprises a partial N_H by N_U IFFT transform circuit with N_H the length of said finite time response.

37. The device of Claim 34, wherein said time-to-frequency domain circuit comprises:

a plurality of multipliers configured to multiply a partial N_F by N_H FFT matrix with said maximum likelihood time domain estimates; and

a storage device, at least capable of storing said partial N_F by N_H FFT matrix.

38. The device of Claim 34, wherein said time-to-frequency domain circuit comprises a partial N_F by N_H FFT transform circuit.

39. The device of Claim 34, wherein said estimation circuit comprises a storage device, being capable of storing a N_H by N_H weighting matrix, being essentially different from the identity matrix, with N_H the length of said finite time response; and circuitry configured to make linear combinations of said time domain measurements thereby using coefficients from said weighting matrix.

40. The device of Claim 33 further comprising:

a plurality of multipliers configured to multiply a N_F by N_U matrix with said reference tones; and

a storage device, being capable of storing at least said N_F by N_U matrix.

41. The device of Claim 33, further comprising a transform circuit, being capable of transforming said received reference tones in time domain measurements and transforming maximum likelihood time domain estimates in frequency domain for obtaining said maximum likelihood frequency domain estimate.

42. The device of Claim 41, wherein said transform circuit comprises a FFT/IFFT circuit.

43. The device of Claim 33, further comprising a storage device being capable of storing at least a partial N_H by N_U IFFT matrix, a partial N_F by N_H FFT matrix and a N_H by N_H weighting matrix.

44. The device of Claim 33, wherein said circuit comprises:

a first subcircuit configured to transform said received reference tone into an intermediate results; and

a second subcircuit configured to transform said intermediate result into said maximum likelihood frequency domain estimates.

45. The device of Claim 44, wherein said first subcircuit comprises:

a plurality of multipliers configured to multiply a partial N_H by N_U weighted IFFT matrix with said reference tones with N_H the length of said finite time response; and

a storage device, at least capable of storing said partial weighted N_H by N_U IFFT matrix.

46. The device of Claim 44, wherein said second subcircuit comprises:

a plurality of multipliers configured to multiply a partial N_F by N_H weighted FFT matrix with said intermediate result with N_H the length of said finite time response; and

a storage device, at least capable of storing said partial N_F by N_H weighted FFT matrix.

47. The device of Claim 33, wherein said receiving peer comprises an OFDM receiver.

48. A system, comprising:

a transmitting device configured to transmit N_U reference tones; and

a receiving device configured to capture said N_U reference tones and to determine from said N_U reference tones a maximum likelihood frequency domain estimate of the channel response of the channel between said transmitting device and said receiving

device at N_F predetermined frequencies by directly exploiting the finiteness of the time response of said channel.

49. The system of Claim 48, wherein said system exploits a subband processing.

50. The system of Claim 49, wherein said subband processing comprises Orthogonal Frequency Multiplexing.